

# UNITED STATES PATENT AND TRADEMARK OFFICE

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<b>Appln. No.:</b> 10/563,194	<b>Group Art Unit:</b> 1638
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<b>Title:</b> NOD-FACTOR PERCEPTION	<b>Customer No.:</b>
	<b>Docket No.:</b> 83196 - 375528

Commissioner for Patents  
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## **PETITION under 37 CFR 1.144**

Applicants petition the Office under 37 CFR 1.144 for review of the restriction requirement made final in the Office Action dated November 21, 2008, the date for timely response being extended three months to expire on May 21, 2009. Applicants respectfully request reconsideration of the proposed lack of unity of invention.

The petition fee and extension of time fees are submitted electronically with this filing. No additional fees are believed due. In the event additional fees are deemed to be outstanding, please debit Deposit Account No. 06-0029.

## **AMENDMENT AND EXTENSION OF TIME**

Concurrent with the filing of this Petition, Applicants have filed a response to the Office Action dated November 21, 2008 amending the claims to more clearly set out the structural and functional technical features of the claimed invention.

### **Pending Claims**

Claims 1-29 are pending. Applicant's election with traverse of Group I and selection of species SEQ ID NO:8 in the Response dated August 27, 2008 resulted in withdrawal of claims 2 and 6-29 as related to a non-elected invention.

### **Argument in Support of Petition for Reconsideration of Unity of Invention**

#### **I. Unity of Invention**

The Examiner maintained and made final restriction of the claims first presented in the Restriction Requirement mailed June 27, 2008. Applicants continue to traverse the restriction and have concurrently submitted a Petition to the Director requesting withdrawal of the Restriction Requirement and consideration of the claims under the appropriate Unity of Invention standard, as stated in PCT Rule 13 and explained in the PCT International Search and Examination Guidelines, Chapter 10, prepared March 24, 2004.

Applicants respectfully assert the Examiner has failed to apply the required Unity of Invention standard in applying a U.S. Restriction of sequences in a manner that permits examination of only one sequence. While "each sequence is a patentably distinct invention", where the inventions are related and share one or more common technical feature that contributes to the prior art, Rule 13.2 permits examination of the inventions as a whole.

##### **1. PCT Rule 13 should be applied**

Applicants assert Unity of Invention according to PCT Rules 13.1 and 13.2 should properly be applied to this application, as the application was submitted under 35 U.S.C. § 371 as the U.S. national stage of PCT/DK/04/00478.

##### **2. PCT Rule 13 - Inventions sharing a common special technical feature**

Rule 13.2 specifies that unity of invention applies where there is a technical relationship between the claimed inventions involving one or more of the same or corresponding special technical features.

The phrase “special technical features” is defined as “those technical features that define a contribution which each of the claimed inventions, considered as a whole, makes over the prior art” (PCT Rule 13.2).

The determination that a particular technical feature makes a contribution over the prior art is made with respect to novelty and inventive step (ISPE para. 10.02).

### **3. The inventions are technically related by one or more technical feature**

The inventions described are Nod-factor binding and claimed are related by structural and functional features. Common technical features include:

- a. common structural features:
  - i. an amount of sequence identity (at least 70%); <sup>1,2</sup>
  - ii. structural domains (Signal peptide, ECD, kinase domain);
  - iii. structural features (2 or 3 LysM motifs in ECD);
- b. common functional features:
  - i. 2 families of Nod-factor binding proteins (NFR5, NFR1) function in a Nod-factor binding element <sup>3</sup>
  - ii. each demonstrated to have specific Nod-factor binding properties that provide perception of strain-specific Nod factors;<sup>4</sup>
  - iii. each alone binds and triggers signaling pathway for nodulation;<sup>5</sup>
  - iv. each alone leads to activation of nodulin gene expression;<sup>6</sup>
  - v. each confers selective rhizobial strain recognition;<sup>7</sup>
  - vi. each confers nodulation to non-nodulating plants<sup>8</sup>
  - vii. use in combination gives best results<sup>9</sup>

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<sup>1</sup> For convenience a brief listing of the sequences is attached as Exhibit D.

<sup>2</sup> See Figures 2, 3, 6, 11 and Tables 1-4 for sequence identity; also see Alignment Tables, Exhibits A (NFR5 alignment), B (NFR1 alignment), C(LysM alignment).

<sup>3</sup> See the published application at paragraphs 0047, 0074, and Example 2

<sup>4</sup> See Example 2 and Tables 6-10

<sup>5</sup> See Examples 2 and 3 and Tables 6-10

<sup>6</sup> See Examples 2 and 3 and Tables 6-10

<sup>7</sup> See Examples 2 and 3 and Tables 6-10

<sup>8</sup> See Tables 6-10

<sup>9</sup> See Example 5, section 4

- c. common structural feature is required for common functional activity
  - i. selective rhizobial strain recognition requires  $\geq 70\%$  identity<sup>10</sup>
  - ii. selective rhizobial strain recognition requires LysM motifs<sup>11</sup>
  - iii. ECD domain sufficient to confer nodulation on non-nodulating plants<sup>12</sup>

These functional and structural features are described in the specification, particularly in the Examples, tables, and Figures. The data in Tables 7-10 demonstrate the NFR5 (SEQ ID NO:8) and NFR1 (SEQ ID NO:25), polypeptides as well as the ECD fragments thereof, each confer nodulation activity on non-nodulating plants.

#### 4. Technical features contribute over the prior art

- a. The Examiner indicated in the Office Action dated November 21, 2008 that claim 3 (reciting SEQ ID NOs: 8, 15, 32, 40, and 48) and claim 5 (reciting SEQ ID NOs: 24, 25, 52, 54, and 8, 15, 32, 40 and 48) without reciting “fragments” are free of the prior art.
- b. The pending art rejections relate to polypeptide fragments. The claims as amended limit the recited fragments to those containing at least two LysM motifs and retain selective binding to Nod-factor.
- c. The Nod-factor binding proteins having the ability to discriminate between and selectively bind chemically modified Nod factors are new.
- d. Prior art fails to disclose specific binding proteins having the sequence, LysM motifs, and strain-specific perception and binding of Nod-factors as claimed.
  - i. Stracke, 2002, *Nature* 417:959  
SYMRK, involved at an early step in the common symbiotic signaling pathway, downstream of perception and binding of microbial signal molecules (specification, p 4; Markmann 2008 PLOS Biology 6:e68, 0500).

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<sup>10</sup> See published application at paragraphs 0099, 0012, 0013, 0117, 0123

<sup>11</sup> See published application at paragraphs 0074, 0082, 0091, 0138, 0139

<sup>12</sup> See published application at paragraphs 0080, 0082, 0138-9, Tables 6,7,8,9,10

- ii. Niebel, 1997, MPML10:132  
Microsomal fractions and radiolabeled Nod-factor, but no genes or proteins are isolated or identified.
- iii. Etzel, US 6,465,716 discloses NBP46, a Nod-factor binding lectin reported to confer the ability to bind carbohydrates in the rhizobial cell wall, conferring apyrase activity

## 5. Additional Material for Review

- a. listing of sequences in Specification
- b. alignment of NFR5 and NFR1 polypeptides, including LysM motifs
- c. inventors' post-filing publication, Radutoiu 2007 *EMBO J* 26:3923
- d. Markmann 2008 *PLOS Biology* 6:e68, 0500

## 6. PCT ISEG, Chapter 10

Applicants direct attention to the Examples contained in the PCT International Search and Examination Guidelines, Chapter 10, for example, those discussing claims to multiple distinct but related sequences such as Examples 32 and 33. Each of these examples frames a specific approach to determining unity of invention:

The sequences “would be regarded as having the same or corresponding technical feature if the alternatives have a common property or activity and shared a significant structural element that is essential to the common property”. (PCT ISEG, Chapter 10, 10.52, 53).

Accordingly, Applicants submit inventions recited in the instant claims share at least one common property, for example, selective binding of Nod-factors for strain-specific perception of Nod-factors and initiation of nodulation in plants) and at least one shared

significant structural element that is required for the common property (for example, sequence identity and extracellular LysM motifs).

As these features are not in the prior art, Applicants submit the instant inventions (first and second Nod-factor binding proteins) would be regarded as having the same or corresponding technical feature, and therefore satisfy the PCT Rule 13 criteria for Unity of Invention.

Withdrawal of the Restriction/Unity requirement examination of the claims as a whole (claims 1- 24) is respectfully requested. A finding of Unity of Invention for claims requiring the common technical feature (LysM motifs, Sequence Identity to SEQ ID NO: 8 (*Lj*NFR5) or to SEQ ID NO:24 (*Lj*NFR1), *e.g.*, claims 1-24, is respectfully requested.

Respectfully submitted,

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